[QMS2020 invited talk]

Perfect Andreev reflection due to Klein paradox in a topological superconducting state

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Klein tunneling, a relativistic phenomenon that enables particles to pass through a barrier perfectly, has been expected to be experimentally observable in Dirac materials, such as graphene and topological insulator. In this presentation, I will talk about the observation of perfect Andreev reflection as a manifestation of Klein tunneling at the interface between a normal metal and a topological superconducting state [1]. Proximity-coupled SmB_6 and YB_6 thin-film heterostructures (*i.e.*, topological insulator and superconductor, respectively) create the topological superconducting state in the SmB_6 layer. Conductance spectra of point contact junctions between a normal metal and the superconducting SmB_6 show exact conductance doubling (*i.e.*, perfect Andreev reflection) within the proximity-induced superconducting gap, which indicates the complete absence of electron backscattering despite the presence of a barrier at the interface. I will show the systematic experiments and the modified BTK theory to elucidate this phenomenon and discuss potential spintronic and superconducting applications.

[1] S. Lee *et al.*, Nature **570**, 344 (2019)